Attorney's Docket No.: 42390P9148

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:	Examiner: Singh, Dalip K.
Valery Kuriakin, et al.	Art Group: 2676
Serial No.: 09/607,825	
Filed: June 30, 2000	
For: **A METHOD AND APPARATUS FOR IMPROVED MEMORY MANAGEMENT OF VIDEO IMAGES**	

APPEAL BRIEF

Mail Stop Appeal Brief - Patent
Commissioner for Patents
P. O. 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicants submit the following Appeal Brief pursuant to 37 C.F.R. §41.37(c) for consideration by the Board of Patent Appeals and Interferences. Applicants also submit herewith a check in the amount of $500.00 to cover the cost of filing the opening brief as required by 37 C.F.R. § 1.17(f). Please charge any additional amount due or credit any overpayment to deposit Account No. 02-2666.

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TABLE OF CONTENTS

I. REAL PARTY IN INTEREST

Valery Kuriakin, Alexander Knyazev, Roman Belenov and Yen-Kuang Chen, the parties named in the caption, transferred their rights to that which is disclosed in the subject application through an assignment recorded on November 1, 2000 (011244/0951) in the patent application to Intel Corporation, of Santa Clara, California. Thus, as the owner at the time the brief is being filed, Intel Corporation, of Santa Clara, California is the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences which will affect or be affected by the outcome of this appeal.

III. STATUS OF CLAIMS

Claims 1, 2, 4, 5, 14, 17, 29, 31-33, 35-37, 39-41 and 43-48 are pending. Claims 1, 2, 4, 5, 14, 17, 19 and 45-48 are rejected in this application. Claims 29, 31-33, 35-37, 39-41, 43 and 44 are allowed in this application. Applicants hereby appeal the rejection of rejected Claims 1, 2, 4, 5, 14, 17, 19 and 45-48. However, Applicants respectfully submit that allowed Claims 29, 31-33, 35-37, 39-41, 43 and 44 do not form part of the Appeal.

IV. STATUS OF AMENDMENTS

The claims are amended in accordance with the Response Amendment filed on April 19, 2004, wherein Claims 1, 2, 4, 5, 14, 17 and 19 were amended and Claims 45-48 were added. The claim amendments and new claims requested in the Response Amendment filed on April 19, 2004 regarding amended Claims 1, 2, 4, 5, 14, 17 and 19 and new Claims 45-48 were entered.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The pending claims relate to a method and apparatus for improved memory management of video images. Claims 1 and 17 recite a mixed storage format as illustrated with reference to FIG. 5C of Applicants' specification. As recited by claims 1 and 17, color components of an image of first color component type are stored in a planar format. Conversely, color components of the image of a second color component type and a third color component type are stored in a packed format, such that the color components of the image are stored in a mixed format of planar format and packed format, as illustrated in FIG. 5C of Applicants' specification.

As described by Applicants' specification, storage of the reference frames 260 and MPEG data 256 in the mixed storage format 300 optimizes motion compensation of the decoded block 252 as depicted in FIGS. 6A and 6B. Accordingly, as illustrated with reference to Figs. 6A and 6B, Claims 1 and 17 recite motion compensating the color components of the image in the mixed

format of planar format and packed format. (*See*, pg. 8, line 14 to pg. 10, line 3 of Applicants' specification.)

Claims 5 and 14 recite analogous claim features as illustrated with reference to FIG. 12 of Applicants' specification. As recited by Claims 5 and 14, an image consisting of a plurality of color components is received, wherein the plurality of color components are received in a format as one of the planar format and a packed format, for example, as indicated process block 602, FIG. 12. Once received, as indicated in process block 604 of FIG. 12 of Applicants' specification, the plurality of color components are converted into a mixed format of planar format and packed format.

As shown in FIG. 5C, the color components of the first color component type are stored in a planar format and color components of a second color component type and a third component color component type are stored in a packed format. Once stored, the plurality of color components of the image in the mixed format of planar format and packed format are motion compensated, for example, as described by Applicants' specification beginning at pg. 8, line 14 continuing to pg. 10, line 3. (*See*, FIGS. 6A and 6B.)

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection involved in this appeal are as follows:

Are Claims 1, 2, 5, 6, 14, 15, 17 and 45-48 unpatentable under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,907,500 issued to Nadehara ("Nadehara") in view of U.S. Patent No. 6,326,984 B1 issued to Chow, et al. ("Chow")?

Are Claims 4 and 19 unpatentable under 35 U.S.C. §103(a) as being unpatentable over Nadehara in view of Chow as applied to Claim 1 and further in view of U.S. Patent No. 6,07,690 issued to Yamada et al. ("Yamada")?

The Examiner has allowed Claims 29, 31-33, 35-37, 39-41, 43 and 44 over the prior art. Hence, Applicants respectfully submit that allowed Claims 29, 31-33, 35-37, 39-41, 43 and 44, do not form part of the Appeal.

VII. ARGUMENT

A. Overview of the Cited References

1. Overview of Nadehara Reference

Nadehara describes a motion compensation adder for decoding/decompressing compressed moving pictures. Nadehara discloses:

> A data storage format in which four 8-bit pixel values are packed into 32-bit length register without any gap (herein referred to as "packed format"), thereby reducing the operation amount per pixel and increasing the speed of the compensation processing, (col. 9, lines 15-19). (Emphasis added.)

Conventionally, the number of bits used to represent each pixel determines how many colors or shades of gray can be displayed. Nadehara describes an 8-bit color mode in which 8 bits are used for each pixel making it possible to display 256 (2^8) different colors or shades of gray.

Conventionally, pixel values, specifically 8-bit pixel values, enable the encoding of up to 256 colors (0 . . . 255) for the coloration of pixels on a screen. Hence, the 8 bits used to represent a pixel as taught by Nadehara encode a final color value of the pixel in contrast to a color model. A color model generally provides an abstract mathematical model describing the ways colors can be represented as tuple of numbers typically is three values or color components.

As known to those skilled in the art, color components are blended to generate a final color value. Conversely, 8-bit pixels, as taught by Nadehara, do not include color component types but merely encode a final color value, which is decoded to determine a color shading of the respective pixel, such that when the combination of pixels are viewed on the screen, an image is displayed.

Hence, Nadehara is simply directed to a motion compensation adder for increasing motion compensation processing speed by providing a single instruction multiple data (SIMD) multiply by accumulate instruction for reducing the number of operations per pixel required to achieve motion compensation. (*See*, col. 8, lines 60-67 and col. 10, lines 47-65.)

2. Overview of Chow Reference

Chow describes a method and apparatus for storing and displaying video image data in a video graphics system. As described within Chow:

> A need exists for a method and apparatus for storing and displaying video image data in video graphic system which reduces the amount of memory bandwidth required while allowing the image data to be fetched and displayed without corruption. (col. 2, lines 1-5.) (Emphasis added.)

Accordingly, Chow teaches:

> Packing and interleaving the video image data within the memory allows fetches from the memory to be performed more efficiently and using less bandwidth. By understanding that the groups of image data will be fetched together from the memory and placing image data which will be used within those groups, efficiency of the memory image is greatly enhanced, thus allowing video and graphics images to be stored and utilized effectively within a single system. (col. 2, lines 55-62.) (Emphasis added.)

According to Chow:

> During a store operation, the interleaving/de-interleaving block 30 rearranges the image data before it stores it in memory 10. This rearranging of the data follows fetches from the memory 10 by the display output engine 20 to be more efficient. When data is fetched from memory 10, the interleaving/de-interleaving block 30

must interleave or unarrange the data such that it is in the format expected by the fetching component. (col. 4, lines 23-30.) (Emphasis added.)

In addition, according to Chow, the storage format described of packing U and V planes into a packed UV Plan 80, while allowing the Y plane to remain in its received format provides improve memory access efficiency. According to Chow:

> In typical memory structures, when access to a single page within the memory is performed, it is an efficient access. However, when more than one page within the memory are accessed to retrieve data for processing, a penalty is incurred. (col. 3, lines 63-67.)
>
> For this reason, the data "Y," "U," and "V" planes is intermingled within the present invention to allow these accesses to be more efficient. (col. 4, lines 6-8.) (Emphasis added.)

Accordingly, the memory storage format taught by Chow is provided to enable efficient memory access. However, once the information is retrieved from memory, the information must be interleaved or rearranged such that it is in the format expected by the fetching component. (*See*, col. 4, lines 23-30.) (Emphasis added.)

3. Overview of Yamada Reference

Yamada describes an image data conversion device and method having a function of inserting a delimiter code into position in image data when a predetermined amount is reached.

As described by Yamada;

> A method is provided which includes calculating the amount of data corresponding to a predetermined number of pixels from the results of decoding by the variable length code decoding step; and inserting a predetermined delimiter code in a delimited position in the image data where the amount of data calculated by the data amount calculation step corresponds to the predetermined number of pixel (col. 3, Lines 21-28).

Accordingly, Yamada describes an image conversion device and method which permits image data to be converted with straightforward circuitry and in a short processing time without degradation of image quality. The scheme described is provided to avoid deficiencies of schemes that are not compatible with each other because they are designed for specific image formats. (*See,* col. 2, Lines 54-58.)

B. Rejection of Claims 1, 2, 5, 6, 14, 15, 17 and 45-48 as Obvious Over Nadehara in View of Chow

The Examiner rejected pending Claims 1, 2, 5, 6, 14, 15, 17 and 45-48 under 35 U.S.C. §103(a) as being unpatentable over Nadehara in view of Chow.

1. Errors of Law and Fact in the Rejection

For the reasons provided below, the Examiner has failed to establish a *prima facie* case of obviousness in view of the references of record. The Federal Circuit Court of Appeals in In re Rijckaert, 9 F.3d 1531, 28 U.S.P.Q. 2d 1955 (Fed. Cir. 1993) held that:

> In rejecting claims under 35 U.S.C. § 103, the examiner bears the initial burden of presenting a *prima facie* case of obviousness. . . . "A *prima facie* case of obviousness is established when the teaching from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art.". . . If the examiner fails to establish a *prima facie* case, the rejection is improper and will be overturned. (Emphasis added.) 9 F.3d at 1532, 28 U.S.P.Q. 2d at 1956.

Applicants respectfully submit that the combined teachings of Nadehara in view of Chow would not have suggested the claimed invention to one or ordinary skill in the art, as required to establish a *prima facie* case of obviousness. Id. Hence, a *prima facie* case of obviousness has not been established and the rejection is erroneous and should be overturned. Id.

Nadehara discloses:

> a data storage format in which four 8-bit pixel values are packed into one word (32-bit) length register without any gap (hereinafter referred to as "packed format"), thereby reducing the operation amount per pixel and increasing the speed of the compensation processing. (col. 9, lines 15-19.) (Emphasis added.)

According to the Examiner:

> A pixel value in itself is a color component type and it is not disclosed in an isolated or abstract form. Therefore, the storage of pixel values is not different or distinct from color components,. (*See*, pg. 2 of Final Office Action mailed June 30, 2004.)

In a true color, or 24-bit color system, up to three bytes of data may be allocated for specifying a pixel's color; one byte for each major color component, such as, for example, the R (red), G (green) and B (blue) components of the RGB color space. Nadehara describes an 8-bit color mode in which 8-bits are used for each pixel, making it possible to display 256 (2^8) different colors or shades of gray. Applicants respectfully submit that Nadehara is strictly limited to the use of 8-bit pixel values, since such 8-bit pixel values enable the packed format of four 8-bit pixel values into a 32-bit length word to reduce the operation amount per pixel and increase the speed of compensation processing. (*See*, Nadehara, col. 9, lines 15-19.)

Accordingly, although a pixel value may be composed of 3 bytes of data allocated for specifying the pixel's color in a 24-bit color system, in an 8-bit color mode in which 8-bits are used for specification of the color represented by a pixel, the 8-bit pixel represents a final color value. Hence, an 8-bit pixel, as taught by Nadehara, is not a color component type, as suggested by the Examiner. In other words, although a pixel may be comprised of one or more bytes to provide a true color system, 8-bit pixel values, as taught by Nadehara, simply provide an encoding of up to

256 (2^8) different colors or shades of gray to represent a final color value and not a color component type, as suggested by the Examiner.

Applicants respectfully submit that since Nadehara is strictly limited to 8-bit pixel values, the storage of 8-bit pixel values, as taught by Nadehara, is in fact different and distinct from color components. Hence, Applicants respectfully submit that the packed format, as taught by Nadehara, is strictly limited to the use of 8-bit pixel values to enable packing of the 8-bit pixel values within a 32-bit word to enable parallel execution of data using, for example, SIMD-type instructions and specifically, an SIMD multiply accumulate instruction, as taught by Nadehara. (*See*, col. 11, lines 25-31.)

Consequently, Applicants respectfully submit that the packed format of 8-bit pixel values, as taught by Nadehara, is distinct from the storage of color components, as recited by the claimed invention. Therefore, Nadehara is devoid of any teachings or suggestions regarding color component types and is simply directed to a motion compensation adder for increasing motion compensation processing speed by providing an SIMD multiply accumulate instruction for reducing the number of operations per pixel required to achieve motion compensation. (*See*, col. 8, lines 60-67 and col. 10, lines 47-65.)

Furthermore, as correctly pointed out by the Examiner, Nadehara fails to disclose storing the plurality of color components in the mixed format of planar format and packed format. As a result, the Examiner cites Chow. According to the Examiner:

> It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device as taught by Nadehara with the feature "storing plurality of color components in the mixed format i.e., planar and packed format" as taught by Chow because it improves the efficiency of fetches from the memory. (*See*, pg. 3, ¶2 of Office Action mailed June 30, 2004.)

Applicants respectfully submit that the modification of Nadehara in view of Chow, as proposed by the Examiner, would require Nadehara alteration of the principle of operation of Nadehara. As indicated by the Federal Court:

> If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. In re Ratti, 270 F.2d 810, 123, U.S.P.Q. 349 (C.C.P.A. 1959)

Here, the teachings of Nadehara are strictly limited to performing motion compensation of 8-bit pixel values stored within 32-bit registers according to a packed format. Nadehara discloses the packed format to reduce the operation amount per pixel and increase the speed of the compensation processing. (*See*, col. 9, lines 15-19.) Applicants respectfully submit that the Examiner fails to illustrate how a pixel value can be stored in a mixed format of planar format and packed format, as taught by Chow.

In fact, Applicants respectfully submit that such a modification would require alteration of Nadehara to operate according to a true color system and convert the final color value of the 8-bit pixels into the Y, U and V color components, as taught by Chow. Applicants respectfully submit that such a modification would alter the principle of operation of Nadehara by requiring conversion of 8-bit pixel values into Y, U and V color components prior to storage.

Therefore, for at least the reasons described above, Applicants respectfully submit that there is no motivation or suggestion to combine the teachings of Nadehara in view of Chow to read on the elements of the claimed invention. Id.

Furthermore, case law has established that obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent the teaching or suggestion supporting such combination. ACS Hospital Sys., Inc. v. Montefiore Hospital, 732 F.2d. 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). Moreover, one cannot find obviousness through hindsight to construct a claimed invention from elements of the prior art. In re Warner, 379 F.2d 1011, 1016, 154 U.S.P.Q. 173, 177 (C.C.P.A. 1967).

Here, the teachings of Nadehara are incompatible with the teachings of Chow and thus, there is no suggestion or motivation to combine these references. The proper motivation or suggestion to combine is lacking since Nadehara is strictly limited to the use of 8-bit pixel values to enable packing of the 8-bit pixel values within a 32-bit word to enable parallel execution of data using an SIMD multiply accumulate instruction, as taught by Nadehara. (*See*, col. 11, lines 25-31.) Conversely, Chow teaches that:

> the data "Y," "U," and "V" planes is intermingled within the present invention to allow these accesses to be more efficient. (col. 4, lines 6-8.)

One of ordinary skill in the art would not be motivated to modify Nadehara in a manner specifically contrary to Nadehara's own teachings. Accordingly, Applicants' claimed invention could only be arrived at through inappropriate hindsight. Id. Applicants respectfully submit that the teachings of Nadehara and Chow, as well as the skill in the art, are insufficient to render the claims *prima facie* obvious. In re Ratti, *supra*. Therefore, Applicants respectfully submit that the Examiner fails to establish that it would be obvious to combine the missing elements provided by Chow with the teachings of Nadehara.

Accordingly, Applicants respectfully submit that the combined teachings of Nadehara and Chow would not have suggested the claimed invention to one or ordinary skill in the art as required to establish a *prima facie* case of obviousness. In re Rijckaert, *supra*. Hence, a *prima facie* case of obviousness has not been established and the rejection is erroneous and should be overturned. Id.

2. Specific Limitations Not Described in the Prior Art

Independent Claims 1, 5, 14 and 17 include analogous claim features. Claim 1 is representative. Independent Claim 1 recites the following claim feature, which is neither taught nor suggested by either Nadehara, Chow or the references of record:

> motion compensating the color components of the image in the mixed format of planar format and packed format. (Emphasis added.)

3. Explanation Why Such Limitations Render the Claims Non-obvious Over the Prior Art

The Examiner fails to illustrate that the combination or modification of Nadehara in view of Chow teaches or suggests each of the recited features of the claimed invention. However, the case law is clear in establishing that "to establish *prima facie* obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art." In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974).

Here, the claimed invention recites:

> motion compensating the color components of the image in the mixed format of planar format and packed format. (Emphasis added.)

As indicated above, according to the Examiner;

> It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device as taught by Nadehara with the feature "storing plurality of color components in the mixed format i.e., planar and packed format" as taught by Chow because it improves the efficiency of fetches from the memory. (*See*, pg. 3, ¶2 of Office Action mailed June 30, 2004.)

Assuming, arguendo, that the skill in the art would provide a motivation to modify Nadehara in view of Chow, as suggested by the Examiner, such modification would fail to teach or suggest motion compensation of the plurality of color components in the mixed format of planar format and packed format, as recited by Claims 1, 5, 14 and 17. As indicated above, Nadehara is strictly limited to the use of 8-bit pixel values to enable packing of the 8-bit pixel values within a 32-bit word to enable parallel execution of data using an SIMD multiply accumulate instruction. (*See*, Nadehara, col. 11, lines 25-31.)

Furthermore, as taught by Chow:

> When data is fetched from memory 10, the interleaving/de-interleaving block 30 must interleave or unarrange the data such that it is in the format expected by the fetching component. (col. 4, lines 27-30.) (Emphasis added.)

Based on the cited passages above, Applicants respectfully submit that assuming, arguendo, a suggestion or motivation for modification of Nadehara in view of Chow, such modification would be strictly limited to conversion of the 8-bit pixel values, as taught by Nadehara, into Y, U and V color components, as taught by Chow, and storage of such color components within memory. In addition, the teachings would require the introduction of an interleaving/de-

interleaving block 30 within Nadehara to reconvert the color component into the 8-bit pixel values, as expected by the SIMD multiply accumulate instruction, as taught by Nadehara. (*See*, col. 11, lines 25-31.)

Yet, the case law is clear in establishing that all claim limitations must be taught or suggested by the prior art. Id. Applicants respectfully submit that for at least the reasons described above, the combination of Nadehara in view of Chow suggested by the Examiner would fail to teach or suggest motion compensation of color components in a mixed format of planar format and packed format, as recited by Claims 1, 5, 14 and 17.

Hence, Applicants respectfully submit that the Examiner fails to establish a *prima facie* case of obviousness of Claims 1, 5, 14 and 17, and that all claim limitations of Claims 1, 5, 14 and 17 are neither taught nor suggested by the combination of Nadehara in view of Chow. Id. Accordingly, Applicants respectfully submit that the Examiner fails to establish a *prima facie* case of obviousness since the teachings from the prior art references of Nadehara in view of Chow would not have suggested the claimed subject matter to one of ordinary skill in the art. In re Rijckaert, *supra*.

Furthermore, Applicants respectfully submit that the modification of Nadehara in view of Chow, as proposed by the Examiner, would render Nadehara unsatisfactory for its intended purpose. As indicated by the Federal Court:

> If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. In re Gordon, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984.)

Here, the teachings of Nadehara are strictly limited to performing motion compensation of 8-bit pixel values stored within 32-bit registers according to a packed format. Nadehara discloses the packed format to reduce the operation amount per pixel and increase the speed of the compensation processing. (*See*, col. 9, lines 15-19.) Hence, modifying Nadehara to perform motion compensation using a mixed format of planar format and packed format, as recited by Claims 1, 5, 14 and 17, would render Nadehara unsatisfactory for its intended purpose of improving motion compensation processing speed of pixel values.

In other words, to perform motion compensation processing using a mixed format of planar format and packed format requires a reformatting of the 8-bit pixel values, as taught by Nadehara, into color components, as taught by Chow. Modifying Nadehara to perform motion compensation of color components in a mixed format of planar format and packed format, as taught by Chow requires additional bits beyond 8-bits to represent the color components. For example, a true color system would require a total 24-bits to represent the color components. Applicants submit that such modification would once again limit Nadehara to motion compensation of 8-bit

pixel values on a one-pixel basis (24-bits of color components per pixel within each 32-bit register) rather than on the four-pixel basis, as provided by the packed format taught by Nadehara. (*See*, col. 9, lines 8–19.)

Hence, Applicants respectfully submit that the Examiner fails to establish a suggestion or motivation to modify Nadehara in view of Chow since such a modification would render Nadehara unsatisfactory for its intended purpose of Nadehara, which is strictly limited to the packing of four 8-bit pixel values within a 32-bit word to enable parallel execution of data using, for example, SIMD-type instructions and specifically, an SIMD multiply accumulate instruction, as taught by Nadehara. (*See*, col. 11, lines 25-31.) Id. In fact, Nadehara teaches away from the Examiner's proposed modification since the modification would limit Nadehara to serial motion compensation of a single pixel value (represented as 8-bit Y, U and V color components), rather than performing motion compensation of four 8-bit pixel values, as taught by Nadehara. (*See*, col. 9, lines 15-19.)

Yet, the case law clearly established that "it is improper to combine references where the references teach away from their combination. In re Grasselli, 713, F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983). Accordingly, Applicants respectfully submit that the Examiner is prohibited from combining Nadehara in view of Chow since Nadehara teaches away from motion compensation of pixel values on a single pixel basis. Id.

Consequently, Applicants respectfully submit that the combined teachings of Nadehara and Chow would not have suggested the claimed invention to one of ordinary skill in the art, as required to establish a *prima facie* case of obviousness. In re Rijckaert, *supra*. Therefore, a *prima facie* case of obviousness of the claims is not established and the rejection of Claims 1, 2, 5, 6, 14, 15, 17 and 45-48 should be overturned. Id.

C. Rejection of Claims 4 and 19 as Obvious over Nadehara in View of Chow and Further in View of Yamada

1. Errors of Law and Fact in the Rejection

The Examiner has made the same errors as described previously with respect to rejected independent Claims 1, 5, 14 and 17. In addition, the Examiner has failed to show that the prior art references of Nadehara, Chow and Yamada teach or suggest all claim features of Claims 4 and 19.

As indicated above, the Examiner's proposed modification of Nadehara in view of Chow would require conversion of the 8-bit pixel values, as taught by Nadehara, into Y, U and V color components, as taught by Chow. Applicants respectfully submit that such a modification would drastically alter the principle of operation of Nadehara. Hence, the teachings of the references are not sufficient to render the claims *prima facie* obvious. In re Ratti, *supra*. Accordingly, Applicants respectfully submit that the Examiner is prohibited from combining

Nadehara in view of Chow since Nadehara teaches away from motion compensation of pixel values on a single pixel basis. Id. In re Grasselli, *supra*.

Regarding the Examiner's citing of Yamada, Applicants respectfully submit that the Examiner's citing of Yamada fails to rectify the deficiencies in the combination of Nadehara in view of Chow. Accordingly, Applicants' claimed invention could only be arrived at through inappropriate hindsight. Therefore, Applicants respectfully submit that the Examiner fails to establish that it would be obvious to combine the missing elements provided by Yamada and Chow with the teachings of Nadehara. Id.

Accordingly, Applicants respectfully submit that the combined teachings of Nadehara in view of Chow and further in view of Yamada, would not have suggested the claimed invention to one or ordinary skill in the art as required to establish a *prima facie* case of obviousness. In re Rijckaert, *supra*. Hence, a *prima facie* case of obviousness has not been established and the rejection is erroneous and should be overturned. Id.

2. Specific Limitations Not Described in the Prior Art

Claim 4 and 19 recite the following claim feature, which is neither taught nor suggested by either Nadehara, Chow, Yamada or the references of record:

> wherein at least one of the plurality of color components of the image are sub-sampled in a dimension of another color component of the image as one of a 4:2:0 space, a 4:2:2 space, and a 4:1:1 space.

3. Explanation Why Such Limitations Render the Claims Non-obvious Over the Prior Art

The Examiner fails to illustrate that the combination and modification of Nadehara in view of Chow and further in view of Yamada teaches or suggests each of the recited features of the claimed invention, as required to establish a *prima facie* case of anticipation. In re Royka, *supra*.

As indicated above, assuming there was a suggestion or motivation to combine Nadehara in view of Chow and further in view of Yamada, this modification would simply teach modification of Nadehara to store 8-bit pixel values as Y, U and V color components in memory. However, the combination would still fail to teach or suggest motion compensation of color components in a mixed format of planar format and packed format, as recited by the claimed invention.

Applicants respectfully submit that the Examiner's citing of Yamada fails to rectify the deficiencies of Nadehara in view of Chow to recite each of the claimed features of Claims 4 and 19. Therefore, Applicants respectfully submit that the Examiner fails to establish a *prima facie* case of anticipation, since the combination of Nadehara in view of Chow and further in view of Yamada fails to teach or suggest all claimed features of the claimed invention. Id.

Accordingly, Applicants respectfully submit that the Examiner fails to establish a *prima facie* case of obviousness, since the teachings of the prior art references of Nadehara in view of Chow and further in view of Yamada would not have suggested the claimed subject matter to a person of ordinary skill in the art. In re Rijckaert, *supra*. Therefore, Applicants respectfully submit that the Examiner fails to establish a *prima facie* case of anticipation and the rejection is therefore improper and should be overturned. Id.

Furthermore, the Examiner is prohibited from establishing a suggestion or motivation for modifying or combining Nadehara in view of Chow and further in view of Yamada to render Claims 4 and 19 obvious since Nadehara specifically teaches away from the combination or modification of Nadehara in view of Chow and further in view of Yamada. In re Grasselli, *supra*.

As indicated above, Nadehara, as well as the skill in the art, teach away from modification of Nadehara to convert 8-bit pixel values into Y, U and V color components, as taught by Chow, since such a modification would drastically alter the principle of operation of Nadehara. In re Ratti, *supra*.

Applicants respectfully submit that the Examiner fails to establish a suggestion or motivation to modify Nadehara in view of Chow since such a modification would render Nadehara unsatisfactory for its intended purpose of Nadehara, which is strictly limited to the packing of four 8-bit pixel values within a 32-bit word to enable parallel execution of data using, for example, SIMD-type instructions and specifically, an SIMD multiply accumulate instruction, as taught by Nadehara. (*See*, col. 11, lines 25-31.) In re Gordon, *supra*.

In fact, Nadehara teaches away from the Examiner's proposed modification since the modification would limit Nadehara to serial motion compensation of a single pixel value (represented as 8-bit Y, U and V color components), rather than performing motion compensation of four 8-bit pixel values, as taught by Nadehara. (*See*, col. 9, lines 15-19.) Accordingly, Applicants respectfully submit that the Examiner is prohibited from combining Nadehara in view of Chow and further in view of Yamada, since Nadehara teaches away from performing of motion compensation of color components on a single pixel basis. In re Gordon, *supra*.

In fact, Applicants submit that modification of Nadehara in view of Chow and further in view of Yamada runs contrary to the explicit teachings of Nadehara. One of ordinary skill in the art would not be motivated to modify Nadehara in a manner explicitly contrary to Nadehara's own teachings. Accordingly, Applicants' claimed invention could only be arrived at through inappropriate hindsight.

Consequently, Applicants respectfully submit that the combined teachings of Nadehara and Chow would not have suggested the claimed invention to one of ordinary skill in the art, as required to establish a *prima facie* case of obviousness. In re Rijckaert, *supra*. Therefore, a

prima facie case of obviousness of the claims is not established and the rejection of Claims 1, 4 and 19 should be overturned. Id.

VIII. CONCLUSION AND RELIEF

Based on the foregoing, Applicant requests that the Board overturn the rejection of all pending claims and hold that all of the claims of the present application are allowable.

Respectfully submitted,

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Dated: January 20, 2005

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, with sufficient postage, in an envelope addressed to: Mail Stop Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on January 20, 2005.

_____
Marilyn Bass January 20, 2005

IX. APPENDIX

The claims involved in this Appeal are as follows:

1. (Previously Presented) A method, comprising:

storing color components of an image of a first color component type in a planar format;

storing color components of the image of a second color component type and a third color component type in a packed format, such that the color components of the image are stored in a mixed format of planar format and packed format; and

motion compensating the color components of the image in the mixed format of planar format and packed format

2. (Previously Presented) The method of claim 1,

wherein the storing the color components of the image in the in the planar format further comprises:

storing luminance components (Y) of the image in a planar array, and

wherein the storing the color components of the image in the packed format further comprises:

storing chrominance components (UV) of the image in a packed array.

3. (Cancelled)

4. (Previously Presented) The method of claim 1, wherein at least one of the color components of the image are sub-sampled in a dimension of another color component of the image as one of a 4:2:0 space, a 4:2:2 space, and a 4:1:1 space.

5. (Previously Presented) A method, comprising:

receiving an image consisting of a plurality of color components, wherein the plurality of color components are received in a format as one of planar format and packed format;

converting the plurality of color components into a mixed format of planar format and packed format, such that color components of a first color component type are stored in a planar format and color components of a second color component type and a third color component type are stored in a packed format; and

motion compensating the plurality of color components of the image in the mixed format of planar format and packed format.

6. (Previously Presented) The method of claim 5, wherein converting the plurality of color components comprises:

storing luminance components (Y) of the image in a planar array, and

storing chrominance components (UV) of the image in a packed array.

7-13 (Cancelled)

14. (Previously Presented) A computer-readable medium having stored thereon a set of instructions, the set of instruction, which when executed by a processor, cause the processor to perform a method comprising:

receiving an image consisting of a plurality of color components, wherein the plurality of color components are received in a format as one of planar format and packed format;

converting the plurality of color components into a mixed format of planar format and packed format, such that color components of a first color component type are stored in a planar format and color components of a second color component type and a third color component type are stored in a packed format; and

motion compensating the plurality of color components of the image in the mixed format of planar format and packed format.

15. (Previously Presented) The computer-readable medium of claim 14, wherein converting the plurality of color components comprises:

storing luminance components (Y) of the image in a planar array, and

storing chrominance components (UV) of the image in a packed array.

16. (Cancelled)

17. (Previously Presented) A computer-readable medium having stored thereon a set of instructions, the set of instruction, which when executed by a processor, cause the processor to perform a method comprising:

storing color components of an image of a first color component type in a planar format;

storing color components of a second color component type and a third color component type in a packed format such that the color components of the image are stored in a mixed format of the planar format and the packed format; and

motion compensating the color components of the image in the mixed format of planar format and packed format.

18. (Cancelled)

19. (Previously Presented) The computer-readable medium of claim 17, wherein at least one of the plurality of color components of the image are sub-sampled in a dimension of another color component of the image as one of a 4:2:0 space, a 4:2:2 space, and a 4:1:1 space.

20-22 (Cancelled)

23. (Withdrawn) A method comprising:

receiving a quantized block of an image;

performing inverse quantization on the quantized block to generate a frequency spectrum for the quantized block;

performing inverse discrete cosine transformation of the quantized block using the frequency spectrum to generate a decoded block;

repeating the receiving, decoding, performing and performing for a plurality of encoded blocks, such that a plurality of decoded blocks are formed;

motion compensating the plurality of blocks as a group thereby generating a plurality of motion compensated (MC) blocks and;

repeating the receiving, decoding, performing, performing, repeating and motion compensating for each quanitized block of the image.

24. (Withdrawn) The method of claim 23, where the motion compensating of the plurality of blocks further comprises:

using as the plurality of blocks four blocks, such that four MC blocks are generated as the plurality of MC blocks; and

writing pixel data of the four MC blocks as a group and in a sequential manner to a frame buffer, such that prior to being burst written to the frame buffer, the pixel data is temporarily held in an entry of a write-combining (WC) buffer, thereby eliminating partial writes from the WC buffer.

25. (Withdrawn) The method of claim 23, wherein the decoded blocks are represented in a YUV color space, planar storage format and the motion compensating further comprises:

storing luminance components (Y) of the decoded blocks in a planar array; and

storing chrominance components (UV) of the decoded blocks in a packed array, such that the decoded blocks are converted into a mixed storage format of planar format and packed format.

26. (Withdrawn) A computer-readable medium having stored thereon a set of instructions, the set of instruction, which when executed by a processor, cause the processor to perform a method comprising:

receiving a quantized block of an image;

performing inverse quantization on the quantized block to generate a frequency spectrum for the quantized block;

performing inverse discrete cosine transformation of the quantized block using the frequency spectrum to generate a decoded block;

repeating the receiving, decoding, performing and performing for a plurality of encoded blocks, such that a plurality of decoded blocks are formed;

motion compensating the plurality of blocks as a group thereby generating a plurality of motion compensated (MC) blocks and;

repeating the receiving, decoding, performing, performing, repeating and motion compensating for each quanitized block of the image.

27. (Withdrawn) The computer-readable medium of claim 18, where the motion compensating of the plurality of blocks further comprises:

using as the plurality of blocks four blocks, such that four MC blocks are generated as the plurality of MC blocks; and

writing pixel data of the four MC blocks as a group and in a sequential manner to a frame buffer, such that prior to being burst written to the frame buffer, the pixel data is temporarily held in an entry of a write-combining (WC) buffer, thereby eliminating partial writes from the WC buffer.

28. (Withdrawn) The computer-readable medium of claim 26, wherein the decoded blocks are represented in a YUV color space, planar storage format and the motion compensating further comprises:

storing luminance components (Y) of the decoded blocks in a planar array; and

storing chrominance components (UV) of the decoded blocks in a packed array, such that the decoded blocks are converted into a mixed storage format of planar format and packed format.

29. (Previously Presented) A method, comprising:

receiving a decoded block of color components of an image in a mixed format of a motion packed format and a planar format;

motion compensating the decoded block of color components in the mixed format according to a motion vector and a reference frame stored in the mixed format of the packed format and the planar format;

storing a reference frame from motion compensation of the decoded block in the mixed format of the planar format and packed format; and

repeating the receiving, the converting and the storing for each decoded block of color components of the image.

30. (Withdrawn) The method of claim 29, further comprises:

using as the plurality of blocks of color components four blocks of color components; and

writing pixel data of the four blocks as a group and in a sequential manner to a frame buffer, such that prior to being burst written to the frame buffer, the pixel data is temporarily held in an entry of a write-combining (WC) buffer, thereby eliminating partial writes from the WC buffer.

31. (Previously Presented) The method of claim 29, further comprising: converting the block of color components into the planar format.

32. (Previously Presented) The method of claim 29, further comprising:

converting the motion compensated blocks of color components into a red, blue, green format to form a decoded image.

33. (Previously Presented) A computer-readable medium having stored thereon a set of instructions, the set of instruction, which when executed by a processor, cause the processor to perform a method comprising:

receiving a decoded block of color components of an image in a mixed format of a packed format and a planar format;

motion compensating the decoded block of color components in the mixed format according to a motion vector and a reference frame stored in the mixed format of the packed format and the planar format;

storing a reference frame from motion compensation of the decoded block in the mixed format of the planar format and the packed format; and

repeating the receiving, the converting and the storing for each block of color components of the image.

34. (Withdrawn) The computer-readable medium of claim 33, further comprises:

using as the plurality of blocks of color components four blocks of color components; and

writing pixel data of the four blocks as a group and in a sequential manner to a frame buffer, such that prior to being burst written to the frame buffer, the pixel data is temporarily held in an entry of a write-combining (WC) buffer, thereby eliminating partial writes from the WC buffer.

35. (Previously Presented) The computer-readable medium of claim 33, further comprising:

converting the block of color components into the planar format.

36. (Previously Presented) The computer-readable medium of claim 33, further comprising:

converting the motion compensated blocks of color components into a red, blue, green format to form a decoded image.

37. (Previously Presented) A method, comprising: receiving a block of a color components of an image in a planar format; decoding the received block to form a decoded block in the planar format;

converting the decoded block of color components into a mixed format of the packed format and the planar format;

motion compensating the decoded block of color components in the mixed format according to a vector and a reference frame stored in the mixed format of the packed format and the planar format; and

repeating the receiving, the decoding, the converting and the motion compensating for each block of color components of the image.

38. (Withdrawn) The method of claim 37, further comprises:

using as the plurality of blocks of color components four blocks of color components; and

writing pixel data of the four blocks as a group and in a sequential manner to a frame buffer, such that prior to being burst written to the frame buffer, the pixel data is temporarily held in an entry of a write-combining (WC) buffer, thereby eliminating partial writes from the WC buffer.

39. (Previously Presented) The method of claim 37, wherein motion compensating comprises;

storing a reference frame from motion compensation of the decoded block in the mixed format of the planar format and packed format.

40. (Previously Presented) The method of claim 37, further comprising:

converting the motion compensated blocks of color components into a red, blue, green format to form a decoded image.

41. (Previously Presented) A computer-readable medium having stored thereon a set of instructions, the set of instruction, which when executed by a processor, cause the processor to perform a method comprising:

receiving a block of a color components of an image in a planar format;

converting the decoded block of color components into a mixed format of the packed format and the planar format;

motion compensating the decoded block of color components in the mixed format according to a vector and a reference frame stored in the mixed format of the packed format and the planar format; and

repeating the receiving, the decoding, the converting and the motion compensating for each block of color components of the image.

42. (Withdrawn) The computer-readable medium of claim 41, further comprises:

using as the plurality of blocks of color components four blocks of color components; and

writing pixel data of the four blocks as a group and in a sequential manner to a frame buffer, such that prior to being burst written to the frame buffer, the pixel data is temporarily held in an entry of a write-combining (WC) buffer, thereby eliminating partial writes from the WC buffer.

43. (Previously Presented) The computer-readable medium of claim 41, wherein motion compensating comprises;

storing a reference frame from motion compensation of the decoded block in the mixed format of the planar format and packed format.

44. (Previously Presented) The computer-readable medium of claim 41, further comprising:

converting the motion compensated blocks of color components into a red, blue, green format to form a decoded image.

45. (Previously Presented) The method of claim 1, wherein the first color component type is a luminance color component type (Y), the second color component type is a chrominance color component type (U) and the third color component type is a chrominance color component type (V).

46. (Previously Presented) The method of claim 5, wherein the first color component type is a luminance color component type (Y), the second color component type is a chrominance color component type (U) and the third color component type is a chrominance color component type (V).

47 (Previously Presented) The computer-readable medium of claim 14, wherein the first color component type is a luminance color component type (Y), the second color component type is a chrominance color component type (U) and the third color component type is a chrominance color component type (V).

48. (Previously Presented) The computer-readable medium of claim 17, wherein the first color component type is a luminance color component type (Y), the second color component type is a chrominance color component type (U) and the third color component type is a chrominance color component type (V).